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IMPROVED GPSR USING COGNITIVE RADIO IN VANET FOR SAFETY MESSAGE TRANSMISSION

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ABSTRACT

VANET is vehicular Ad-hoc network which is used for intelligent transport system for the drivers the ad-hoc network is used to transmit various types of message over the network. Safety message has to transmit for the security reasons on the vehicle and road transportation various routing protocols have been utilized for the purpose of message transmission. GPSR, AODV, DSR, PUMA these are various routing protocol utilizes for message transmission VANET scenario is used for mainly V2V and V2R purposes. In various scenarios message transmission is done according to vehicle density available on the road. The main issue of road density is due to high load on road message communication get overhead due to less amount of network bandwidth to overcome this issue cognitive radio bandwidth can be utilize for data transmission by channel sensing and message can be transmit through cognitive radio channels.

Keywords: VANET, Cognitive Radio, Spectrum Sensing, GPSR, AODV, DSR.

1. INRTODUCTION

1.1 VANET

A VANET uses cars as mobile nodes in a MANET to create a mobile network. A VANET turns turn participating car into a wireless router or node which allowing cars 100 to 300 meters of each other to connect and create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile network is created. It is estimated that the first systems that will be this technology are police and fire vehicles to communicate with each other for the purpose of security.

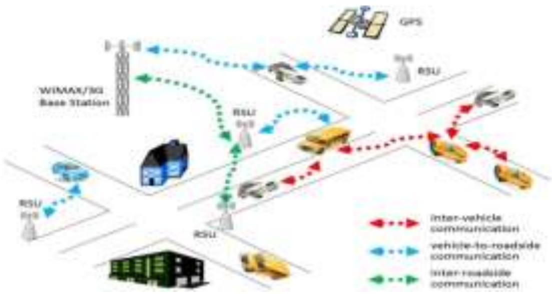

Figure 1.1 VANET

The connectivity is done among one vehicle to other vehicle and vehicle to road side infrastructure and vehicle or road side infrastructures to the central authority responsible for the network maintenance. The basic tool for message transfer is the short range radios that are being installed in any of the nodes. The short transmission node is used by vehicular node. RSU's are spread sporadically or regularly depending on the deployment of the network in any particular region. In reality spread sporadically. They act as an intermediary node between the Central Authority (CA) and Vehicular Node (VN). VANET-Vehicular Ad-Hoc Network is the network in which communication has been done between road side units to cars, car to car in a short range of 100 to 300 m. Existing authentication protocols to secure vehicular ad hoc networks raise challenges like as certificate

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distribution and revocation, avoidance of computation and communication bottlenecks, and reduction of the strong reliance on tamper proof devices.

1.2 Types of Communication in VANET'S

1.2.1 Inter-vehicle communication

The inter-vehicle communication configuration uses multi-hop multicast/broadcast to transmit traffic related information over multiple hops to a group of receivers. In intelligent transportation systems, vehicles need only be concerned with activity on the road ahead and not behind (an example of this would be for emergency message dissemination about an imminent collision or dynamic route scheduling).

1.2.2 Vehicle-To-Roadside Communication

The vehicle-to-roadside communication configuration represents a single hop broadcast where the roadside unit sends a broadcast message to all equipped vehicles in the vicinity. Vehicle-to-roadside communication configuration provides a high bandwidth link between vehicles and roadside units.

1.2.3 Routing-Based Communication

The routing-based communication configuration is a multi-hop unicast where a message is propagated in a multihop fashion until the vehicle carrying the desired data is reached. When the query is received by a vehicle owning the desired piece of information, the application at that vehicle immediately sends a unicast message containing the information to the vehicle it received the request from, which is then charged with the task of forwarding it towards the query source.

1.3 Characteristics of VANET

VANET is an application of MANET but it has its own distinct characteristics which can be summarized as:

- High Mobility**:** The nodes in VANETs usually are moving at high speed. This makes harder to predict a node's position and making protection of node privacy [2].
- Network topology**:** Due to high node mobility and random speed of vehicles, the position of node changes frequently. As a result of this, network topology in VANETs tends to change frequently.
- Unbounded network size: VANET can be implemented for one city, several cities or for countries. This means that network size in VANET is geographically unbounded.
- Frequent exchange of information**:** The ad hoc nature of VANET motivates the nodes to gather information from the other vehicles and road side units. Hence the information exchange among node becomes frequent.
- Wireless Communication**:** VANET is designed for the wireless environment. Nodes are connected and exchange their information via wireless. Therefore some security measure must be considered in communication.
- Time Critical: The information in VANET must be delivered to the nodes with in time limit so that a decision can be made by the node and perform action accordingly.
- Sufficient Energy**:** The VANET nodes have no issue of energy and computation resources. This allows VANET usage of demanding techniques such as RSA, ECDSA implementation and also provides unlimited transmission power.
- Better Physical Protection**:** The VANET nodes are physically better protected. Thus, VANET nodes are more difficult to compromise physically and reduce the effect of infrastructure attack.

1.4 Cognitive Radio

A cognitive radio is an intelligent radio that can be programmed and configured dynamically. Its transceiver is designed to use the best wireless channels in its vicinity. Such a radio automatically detects available channels in wireless spectrum, then accordingly changes its transmission or reception parameters to allow more concurrent wireless communications in a given spectrum band at one location.

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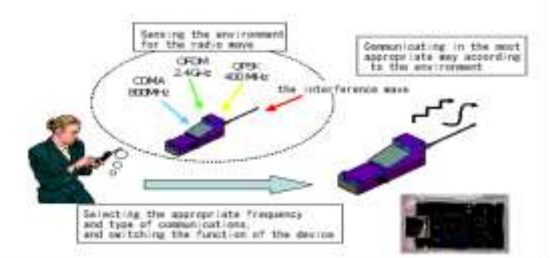

Figure 1.2: Cognitive Radios

This process is a form of dynamic spectrum management. In response to the operator's commands, the cognitive engine is capable of configuring radio-system parameters. These parameters include "waveform, protocol, operating frequency, and networking". This functions as an autonomous unit in the communications environment, exchanging information about the environment with the networks it accesses and other cognitive radios (CRs).

1.5 Spectrum Sensing

The important requirement of cognitive radio network is to sense the spectrum hole. Cognitive radio has an important property that it detects the unused spectrum and shares it without harmful interference to other users. It determines which portion of the spectrum is available and detects the presence of licensed users when a user operates in licensed band.

The spectrum sensing enables the cognitive radio to detect the spectrum holes. Spectrum sensing techniques can be classified as frequency domain approach and time domain approach. In frequency domain method estimation is carried out directly from signal so this is also known as direct method. In time domain approach, estimation is performed using autocorrelation of the signal.

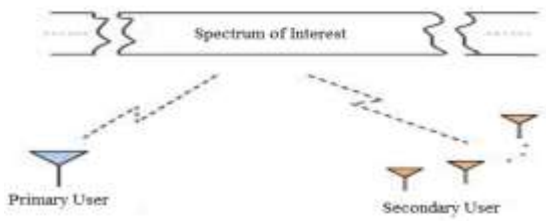

Figure 1.3: Spectrum Sensing

2. RELATED WORK

Joanne Mun-Yee Lim et.al (2014) Vehicular communications are important to ensure emergency messages are transmitted on time to prevent accidents. Therefore, in recent years, various standardization bodies and automobile companies have developed vehicular ad hoc network (VANET) to ensure public road safety. The current IEEE802.11p schemes utilize only traffic type to categorize priority levels. However, accidents are prone to occur when vehicles are in close distance. Therefore, based on the latest standard draft of IEEE1609.4 and IEEE802.11p, the proposed scheme, namely Enhanced Priority VANET Scheme (EPVS) is proposed where distance range between vehicles is derived and transmission priority level is categorized based on reliable distance range and data type. Performance of the proposed EPVS is evaluated in Vehicles in Network Simulation (Veins) with road traffic simulator, Simulation of Urban mobility (SUMO) using a realistic urban map. Simulations results show that the proposed EPVS results in lower average delay, in comparison with the default IEEE802.11p scheme. [1]

Kalkundri Ravi et.al (2014) A Vehicular Ad Hoc Network (VANET) is a part of MANETs that is formed by wireless connections between cars. In VANETs, routing protocols and other routing related techniques must be adaptable to vehicular-specific capabilities and requirements. Along with the routing in VANET, message security is also one of the major concern. Messages are critical and important like a warning message, so that the message must be authenticated which guarantee's the message integrity. The authentication of these messages is

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done with the help of an algorithm called Elliptic Curve Digital Signature Algorithm (ECDSA), which provides an efficient message authentication scheme. A combination of AODV, ECDSA and VANET can make the scenario more efficient and perform better in terms of routing and time delay in message delivery. [2]

Scott E. et.al (2014) A Vehicular Ad Hoc Network (VANET) is a part of MANETs that is formed by wireless connections between cars. In VANETs, routing protocols and other routing related techniques must be adaptable to vehicular-specific capabilities and requirements. Along with the routing in VANET, message security is also one of the major concerns. Messages are critical and important like a warning message, so that the message must be authenticated which guarantee's the message integrity. The authentication of these messages is done with the help of an algorithm called Elliptic Curve Digital Signature Algorithm (ECDSA), which provides an efficient message authentication scheme. A combination of AODV, ECDSA and VANET can make the scenario more efficient and perform better in terms of routing and time delay in message delivery. [3]

Hyun Yu et.al (2013**)** In this paper, author propose a routing protocol that works based on the real-time road vehicle density in order to provide fast and reliable communications so that it adapts to the dynamic vehicular city environment. In the proposed routing mechanism, each vehicle computes the vehicle density of the road to which it belongs by using beacon messages and the road information table. Based on the real-time road vehicle density information, each Vehicle establishes a reliable route for packet delivery. In order to evaluate the performance of the proposed mechanism, we compare our proposed mechanism with GPSR through NS-2 based simulations and show that our mechanism outperforms GPSR in terms of delivery success rate and routing over-head. [4]

Alwakeel, S et.al (2014) In VANET'S Safety messages is very much important so that it must have the highest assurance of delivery. But safety message can be rejected due to its low bandwidth. In this message we implement a approach to block minimum numbers of safety messages. But if you kept non safety message it can be penalized you. Through virtually partitioned VANET's bandwidth and by applying P-Persistent scheme to reduce message congestion an improved performance of message dissemination in VANETs can be achieved. [5]

3. PROBLEM FORMULATION

VANET is an extension of MANET; VANET is vehicular Ad-hoc network which is used for intelligent transport system for the drivers the ad-hoc network is used to transmit various types of message over the network. Safety message has to transmit for the security reasons on the vehicle and road transportation various routing protocols have been utilized for the purpose of message transmission. GPRS, AODV, DSR, PUMA these are various routing protocol utilizes for message transmission VANET scenario is used for mainly V2V and V2R purposes. V2V is vehicle to vehicle communications and V2R is vehicle to roadside communication. In various scenarios message transmission is done according to vehicle density available on the road. Based on the real time road density vehicle establish reliable route for the communication on packet delivery.
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The main issue of road density is due to high load on road message communication get overhead due to less amount of network bandwidth to overcome this issue cognitive radio bandwidth can be utilize for data transmission by channel sensing and message can be transmit through cognitive radio channels.

4. PROPOSED WORK

VANET scenario is used for transmission of various messages is the vehicle communication. Various phases have been derived for proposed work that is described below in the form of the flow chart. Flow chart has the flow from the generation of the VANET to the analysis of the considered parameters through the various phases.

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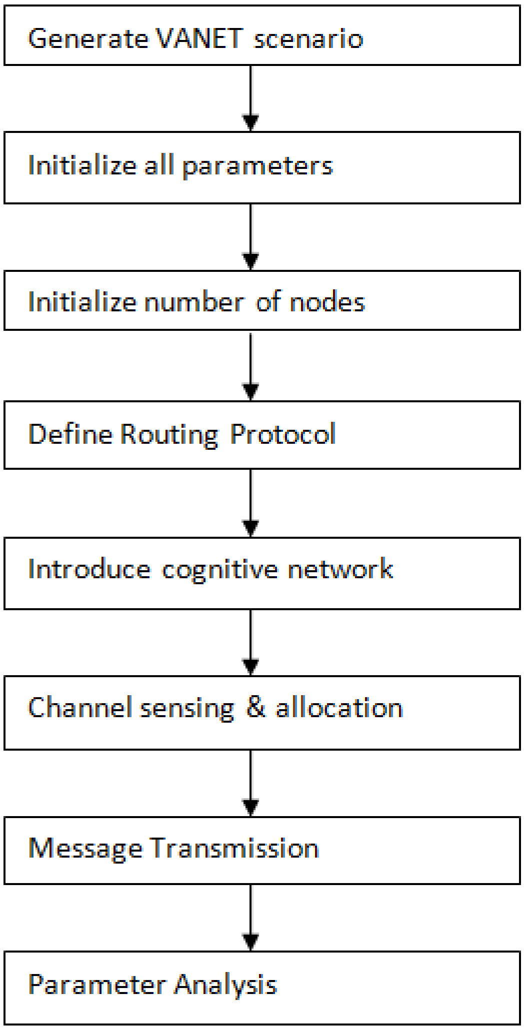


Phase 1: In this phase VANET scenario is initialize by defining are of simulation no. of vehicle in direction reverse direction their mobility.
Phase 2: In this phase various communications between different vehicles and roadside unit will take place using GPSR protocol for the communication process.
Phase 3: In this phase cognitive radio bandwidth has been utilized for the transmission of packets from vehicle to vehicle and vehicle to RSU and RSU to vehicle by sensing channel. The channel is free that can be allocated for communication.

5. RESULTS

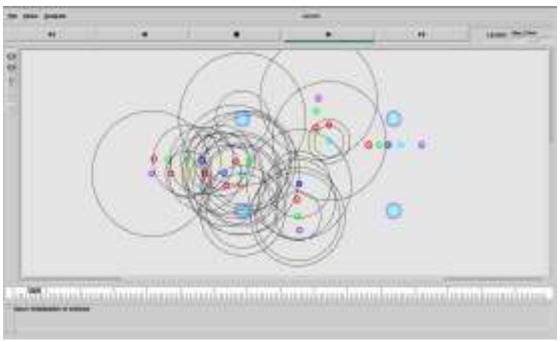


Fig 5.1: Initialization of nodes

This scenario is use to represent the initialization of nodes.

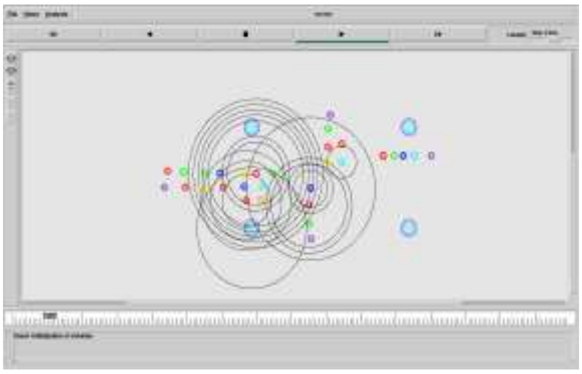


Fig 5.2: Data transmission

This scenario is use to represent the data transmission between the nodes.

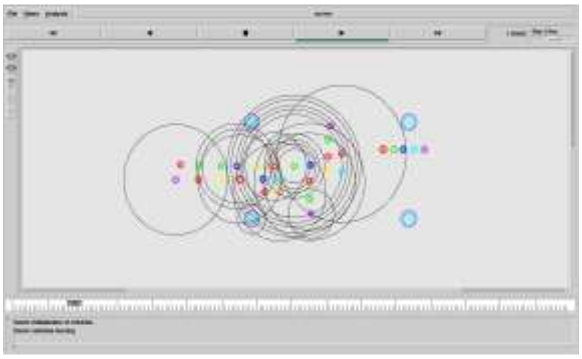
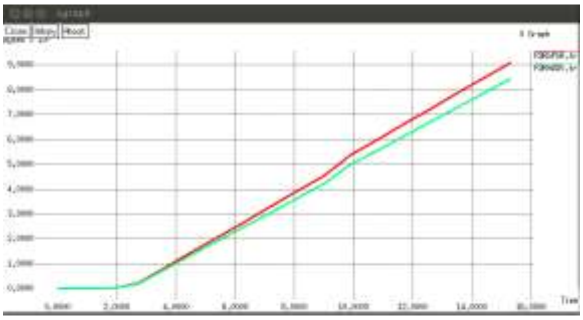


Fig 5.3: Apply GPSR Protocol

In this scenario we apply the GPSR protocol to find or trace the location of the nodes



Graph 5.1: Packet Delivery Ratio

It is the ratio of all the received data packets at the destination to the number of data packets sent by all the sources. It is calculated by dividing the number of packet received by destination through the no. of packet originated from the source.

PDR = (P r / P s) * 100

In this graphical representation comparison has been made between delay with AODV & with GPSR. So that the Packet Delivery Ratio with GPSR gives better output as compared to AODV.

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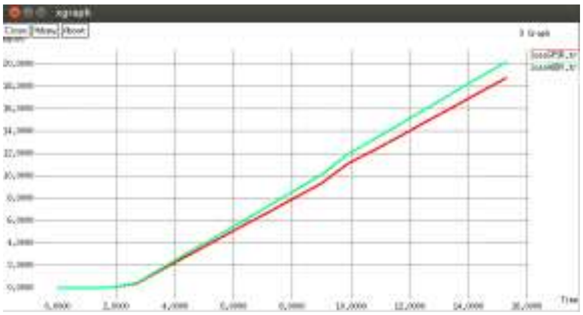
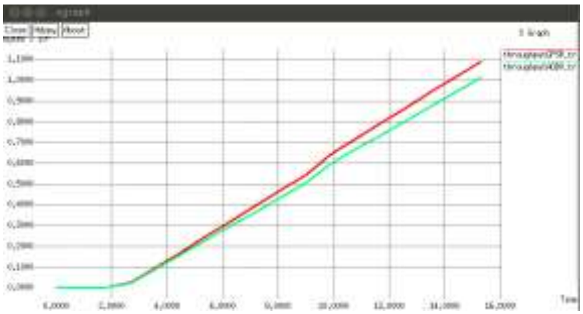


Graph 5.2: Packet Loss

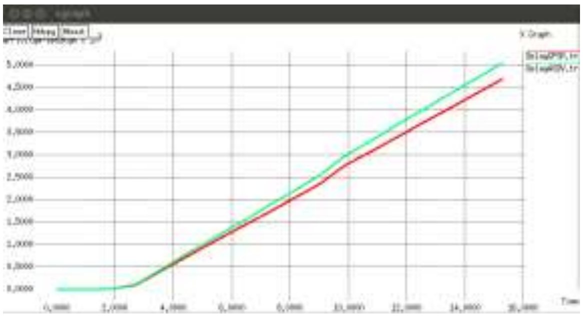
Packet loss occurs when one or more packets of data travelling across a computer network fail to reach their destination. Packet loss is typically caused by network congestion. Packet loss is measured as a percentage of packets lost with respect to packets sent. In this graphical representation comparison has been made between delay with AODV & with GPSR. So that the Packet Loss with GPSR gives better output as compared to the AODV.



Graph 5.3Throughput

It is the average at which data packet is delivered successfully from one node to another over a communication network. It is usually measured in bits per second.

Throughput = (no of delivered packets * packet size) / total duration of simulation.
In this graphical representation comparison has been made between delay with AODV & with GPSR. So that the Throughput with GPSR gives better output as compared to the AODV.



Graph 5.4: Delay

This includes all possible delays caused by buffering during route discovery, latency, and retransmission by intermediate nodes, processing delay and propagation delay. It is calculated as
D = (T r - T s)

Where, T r is receive time and T s is sent time of the packet. In this graphical representation comparison has been made between delay with AODV & with GPSR. So that the Delay with GPSR gives better output as compared to the AODV.

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6. CONCLUSION

A VANET uses cars as mobile nodes in a MANET to create a mobile network. A VANET turns turn participating car into a wireless router or node which allowing cars 100 to 300 meters of each other to connect and create a network with a wide range. A cognitive radio is an intelligent radio that can be programmed and configured dynamically. Its transceiver is designed to use the best wireless channels in its vicinity**.** Safety message has to transmit for the security reasons on the vehicle and road transportation various routing protocols have been utilized for the purpose of message transmission. Communications between different vehicles and roadside unit will take place using GPSR protocol for the communication process. Cognitive radio bandwidth has been utilized for the transmission of packets from vehicle to vehicle and vehicle to RSU and RSU to vehicle by sensing channel. The channel is free that can be allocated for communication.

REFERENCES

[1] Mun-Yee Lim "Cognitive VANET with Enhanced Priority Scheme" International Conf. on Telecommunications and Multimedia (TEMU), 2014, pp 116 – 121.
[2] Kalkundri Ravi "AODV Routing in VANET for Message Authentication Using ECDSA" IEEE Conf. on Communications and Signal Processing (ICCSP), 2014, pp 1389 – 1393
[3] Scott E. "AODV routing in VANET for message authentication using ECDSA" 2014, pp 1389 – 1393.
[4] Hyun Yu "A VANET Routing based on the Real-time Road Vehicle Density in the City Environment" IEEE Conf. on Ubiquitous and Future Networks (ICUFN), 2013, pp 333 – 337.
[5] Alwakeel, S "A virtual P-Persistent bandwidth partitioning manager for VANET's broadcast channel", International conf. on Multimedia Computing and Systems (ICMCS), 2014, PP 1212 – 1215.
[6] Varshney "Security protocol for VANET by using digital certification to provide security with low bandwidth", International Conf. on Communications and Signal Processing (ICCSP), 2014, PP 768 – 772.
[7] Ghosh, T. "Congestion control by dynamic sharing of bandwidth among vehicles in VANET", International Conf. on Intelligent Systems Design and Applications (ISDA), 2014, PP 291 – 296.
[8] Gandhi, U.D "Request Response Detection Algorithm for detecting DoS attack in VANET", International Conf. on Optimization, Reliability, and Information Technology (ICROIT), 2014, PP 192 – 194.
[9] Meriam, E. "VANET adaptive and Reliable Broadcast protocol", International Conf. on Wireless Communications and Mobile Computing Conference (IWCMC), 2014, PP 237 –243.
[10] Ali J. Ghandour a, Kassem Fawaz a, Hassan Artail a, Marco Di Felice b, Luciano Bononi "Improving vehicular safety message delivery through the implementation of a cognitive vehicular network" IEEE Conf. on Telecommunications (ICT), 2013, PP 123-765

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